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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/078,766	02/19/2002	Takeshi Miura	51380	4845
21874	7590	03/25/2005	EXAMINER	
EDWARDS & ANGELL, LLP			LEADER, WILLIAM T	
P.O. BOX 55874			ART UNIT	PAPER NUMBER
BOSTON, MA 02205			1742	

DATE MAILED: 03/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/078,766

Applicant(s)

MIURA ET AL.

Examiner

William T. Leader

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 February 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 5 and 7-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 5 and 7-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. A request for continued examination under 37 CFR 1.114 was filed in this application after appeal to the Board of Patent Appeals and Interferences, but prior to a decision on the appeal. Since this application is eligible for continued examination under 37 CFR 1.114 and the fee set forth in 37 CFR 1.17(e) has been timely paid, the appeal has been withdrawn pursuant to 37 CFR 1.114 and prosecution in this application has been reopened pursuant to 37 CFR 1.114. Applicant's submission filed on February 16, 2005 has been entered.
2. Claims 5 and 7-11 are pending.
3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claim Rejections - 35 USC § 102

4. Claims 5 and 7-11 are rejected under 35 U.S.C. 102(e) as being anticipated by Nagai et al (6,709,563).
5. As indicated in the previous office action, the Nagai et al patent is directed to a copper-plating bath that is suitable for use in electrodepositing copper to form interconnects, including a trench, on a semiconductor wafer. See Figs. 39A-39C and column 1, lines 31-40. The plating bath should include a complexing agent which can improve plating uniformity (column 2, lines 36-42). The pH of the plating bath

may be maintained with a range of 7-14 (column 2, lines 57-60. This range overlaps and anticipates applicant's range as recited in instant claim 5 at pH values of 7-8.4.

6. Nagai et al disclose a number of suitable complexing agents. These include ethylenediamine tetramethylene phosphonic acid and diethylenetriamine pentamethylene phosphonic acid (column 3, lines 22-31). This portion of the Nagai et al patent teaches the limitations of claims 5, 7, 9 and 10.

7. Nagai et al further discloses that the copper-plating bath can be used in plating over an outer seed layer to reinforce the thin portion of the seed layer. See the abstract. This portion of Nagai et al teaches the limitation recited in instant claims 8 and 11.

Claim Rejections - 35 USC § 103

8. Claims 5 and 9-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Krishnamoorthy et al (6,319,387) in view of Florio et al (5,858,198).

9. The Krishnamoorthy et al patent is directed to a copper alloy electroplating bath for microelectronic applications. One known method for forming interconnects is the dual damascene process in which trenches and vias are formed by etching in a dielectric layer on the semiconductor wafer. Barrier and seed layers are formed and copper is deposited to fill the openings. See column 2, lines 43-67. Krishnamoorthy

et al disclose the use of a copper electroplating bath containing a minor amount of alloying metal. Table 1 (column 7) lists a preferred electroplating solution. The solution contains ED or EDTA which serves as a complexing agent and has a pH of about 8 to 11. The inclusion of complexing agents is also disclosed at column 6, lines 48-53. The disclosed pH range overlaps and anticipates applicant's range as recited in instant claim 5 at pH values of 8.0-8.4.

10. Claims 5 and 7-11 differ from Krishnamoorthy et al by reciting particular complexing agents. The Florio et al patent is directed to an electroplating process. In a part of the process a solution containing copper complexing agents is used. Suitable copper complexing agents include ethylenediamine tetraacetic acid (EDTA) and triethanolamine (column 8, lines 38-58). The prior art of record is indicative of the level of skill of one of ordinary skill in the art. It would have been obvious to have utilized triethanolamine as a copper complexing agent in the process of Krishnamoorthy et al because triethanolamine and EDTA are taught to be equivalents by Florio et al.

Response to Amendment

11. Applicant's Remarks have been carefully considered but are not deemed to be persuasive. At page 4 of the Remarks, applicant indicates that a Rule 131

Declaration is being submitted under separate cover which will antedate the Nagai et al patent. To date, this Declaration has not been incorporated into the file.

12. Applicant argues that there is no incentive to utilize a component of a carbonaceous dispersion that is utilized on a printed circuit board in a copper plating composition. This argument is not convincing. Krishnamoorthy et al disclose the use of a copper electroplating bath containing ED or EDTA which serves as a complexing agent. Florio discloses that copper complexing agents include ethylenediamine tetraacetic acid (EDTA) and triethanolamine. Thus, Florio suggests the equivalence of EDTA and triethanolamine as copper complexing agents. In view of this teaching, one of ordinary skill in the art would be led to use one in place of another. Thus, the substitution of triethanolamine for EDTA in the process of Krishnamoorthy et al would have been obvious to one of ordinary skill in the art at the time the invention was made.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 571-272-1244. The fax phone

number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

WL
William Leader
March 15, 2005

ROY KING 
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700